Fig.1.

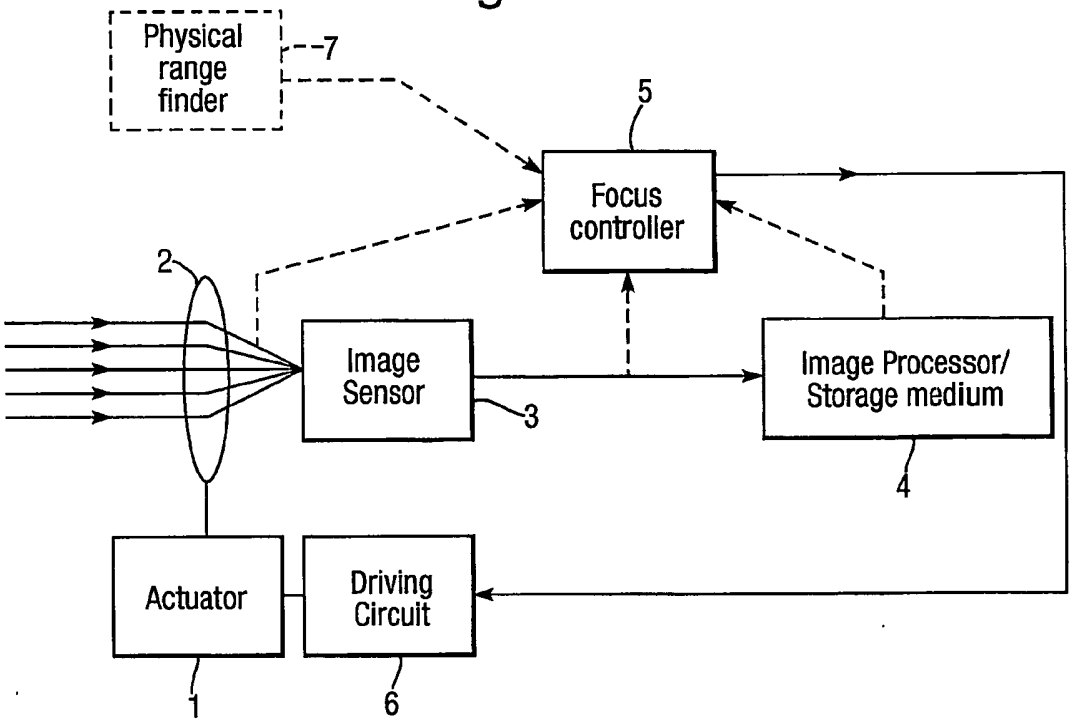

Physical range finder
7
5
Focus controller
2
Image Sensor
3
Image Processor/ Storage medium
4
Actuator
Driving Circuit
1
6

Fig.3.

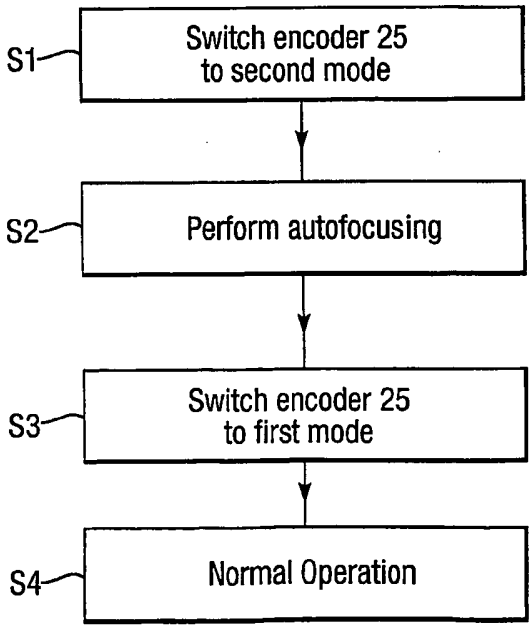

S1
Switch encoder 25 to second mode
S2
Perform autofocusing
S3
Switch encoder 25 to first mode
S4
Normal Operation

Fig.2.

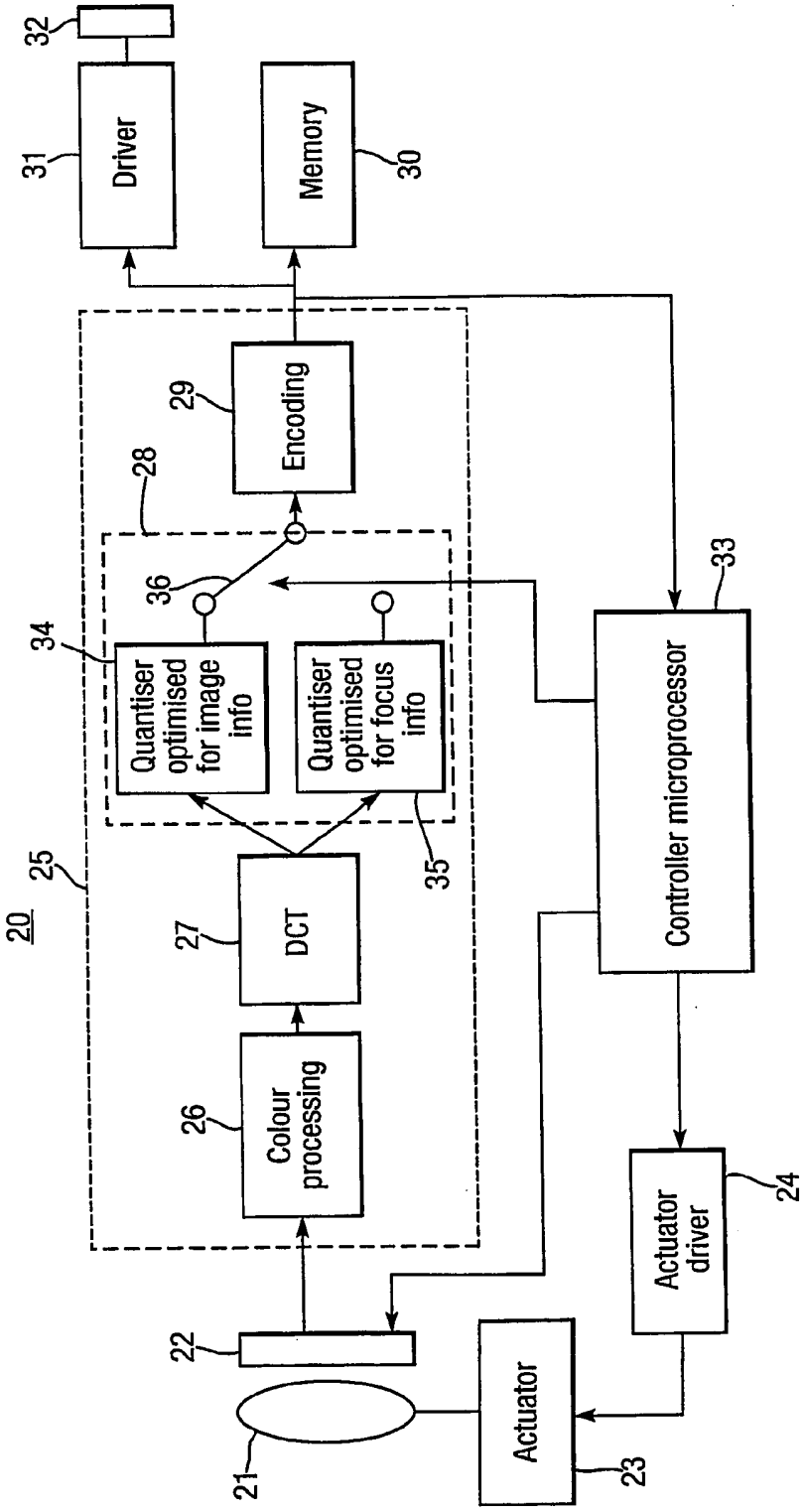

32
Driver
31
Memory
30
Encoding
29
28
36
34
Quantiser optimised for image info
Quantiser optimised for focus info
35
33
Controller microprocessor
20
25
DCT
27
Colour processing
26
Actuator driver
24
22
Actuator
21
23

Fig.4.

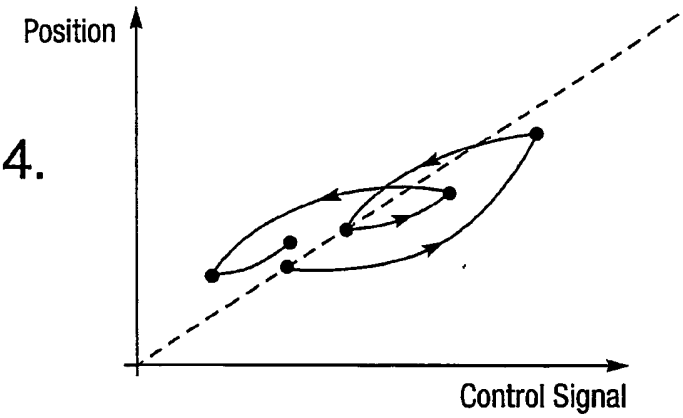


Fig.5.

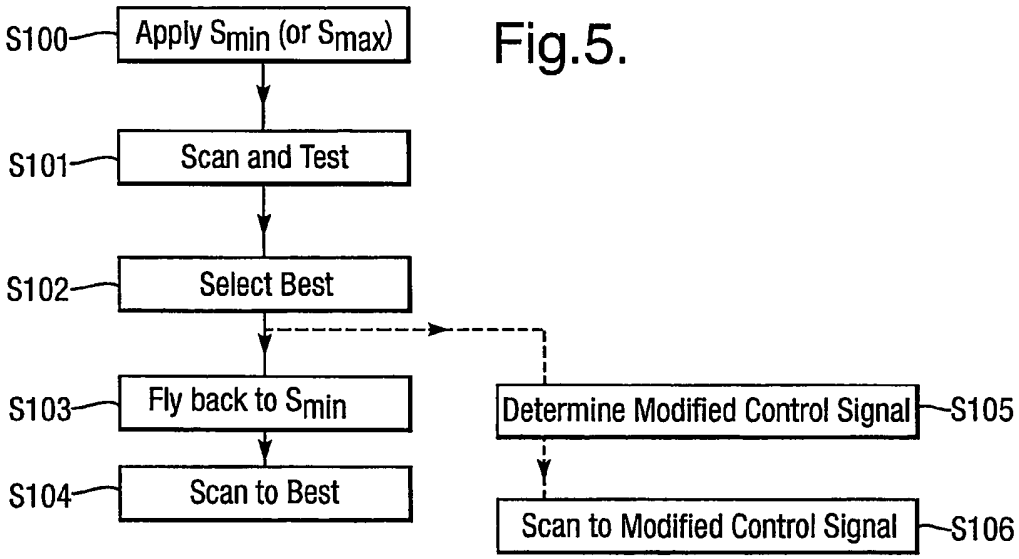


Fig.6.

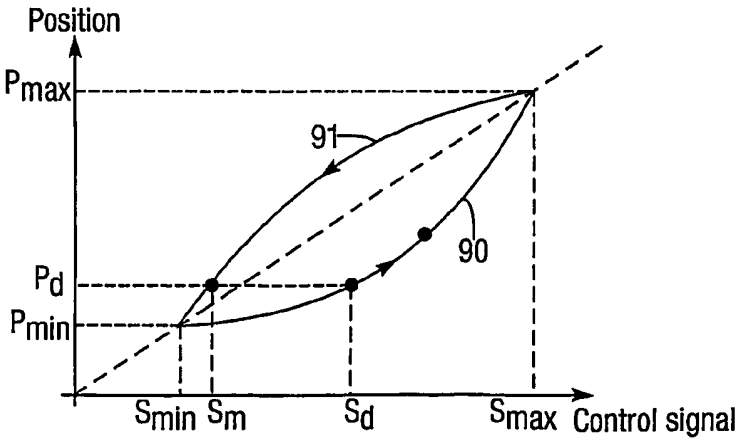


Fig.7.

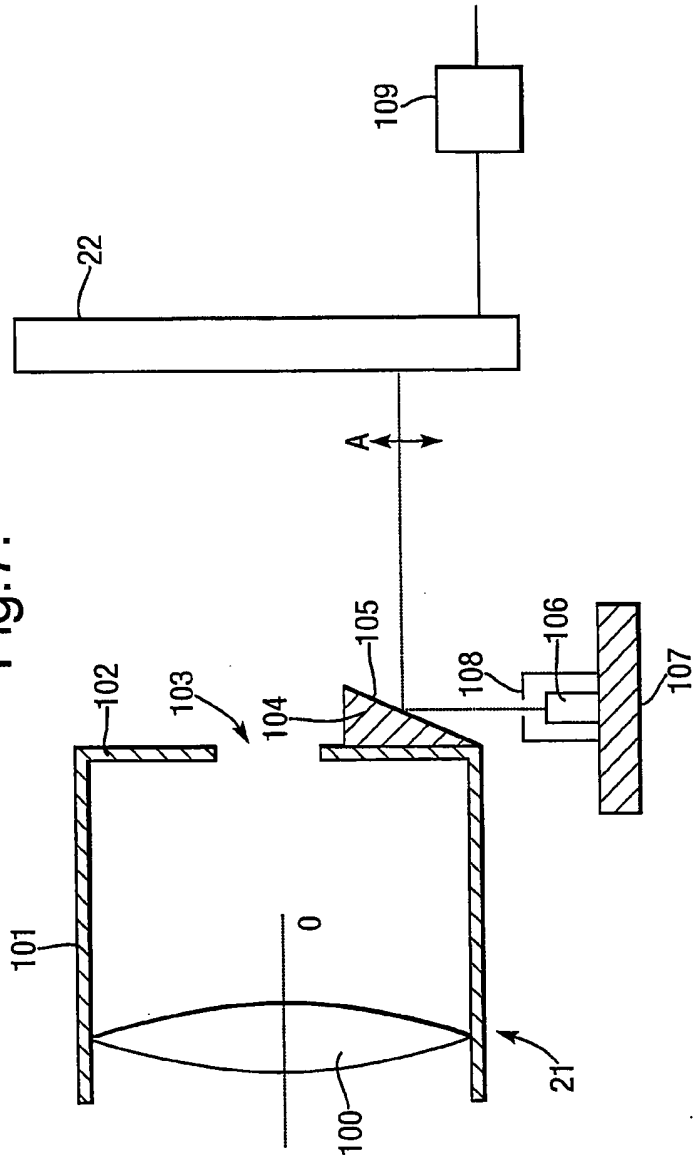


Fig.8.

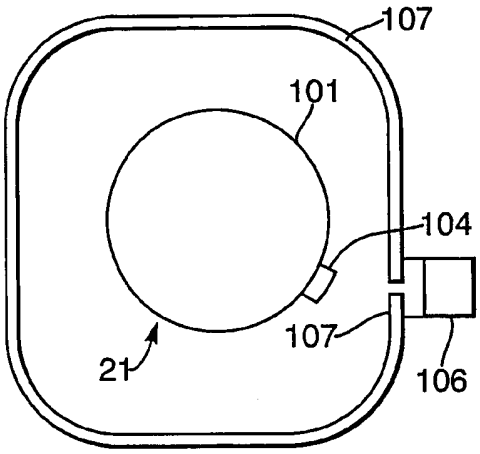


Fig.9.

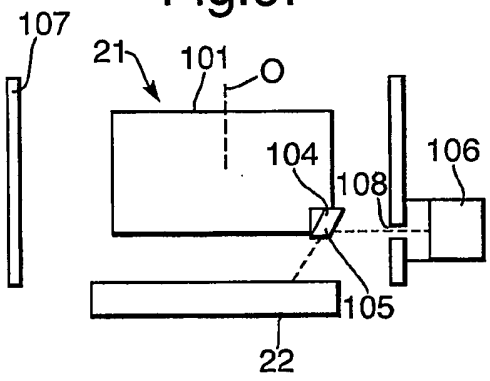


Fig.10.

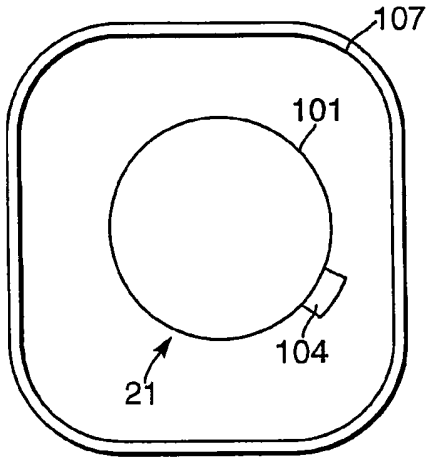


Fig.11.

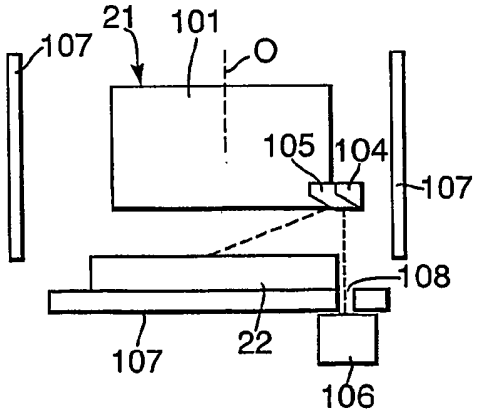


Fig.12.

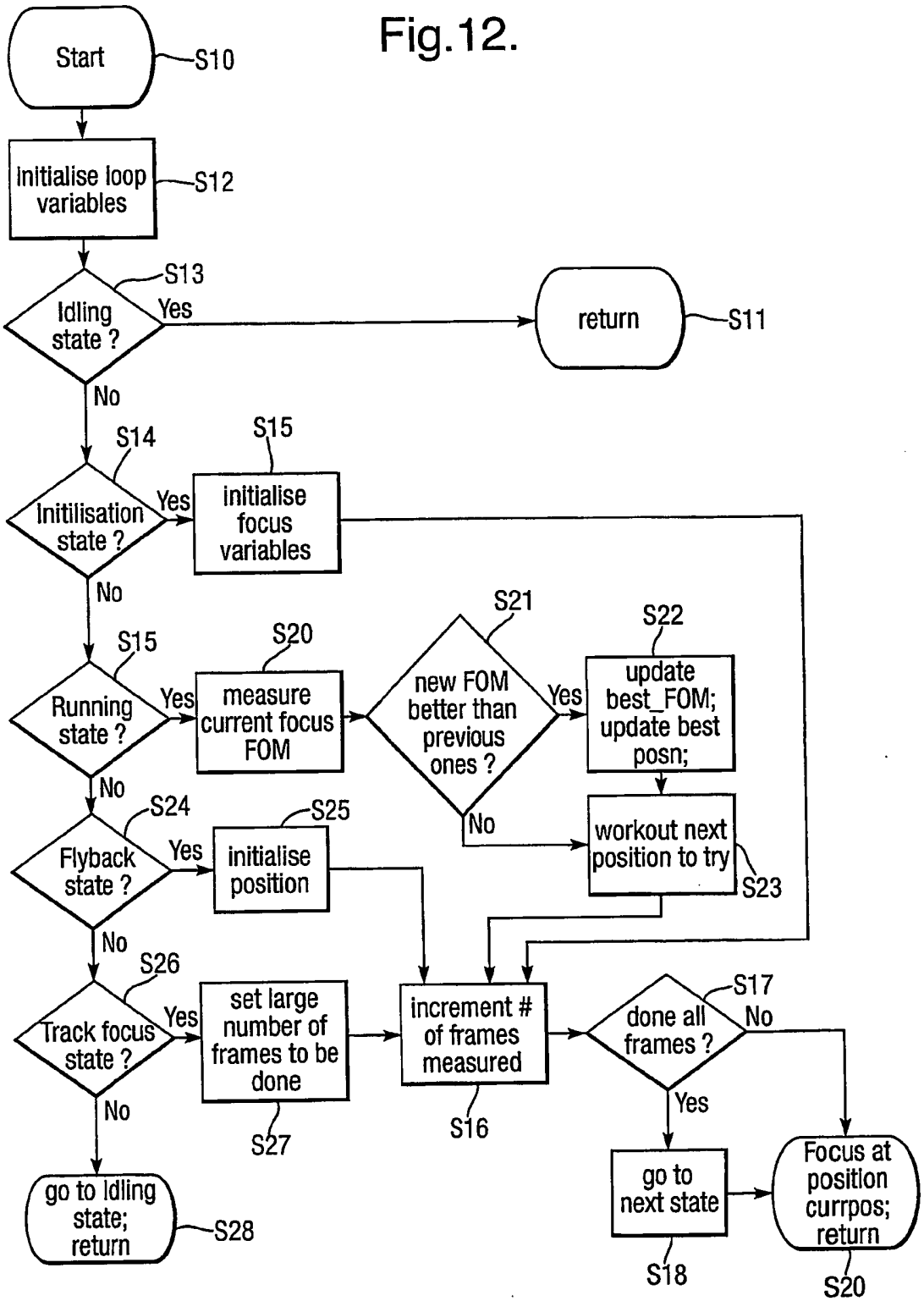

Start
S10
initialise loop variables
S12
S13
Idling state ?
Yes
return
S11
No
S14
S15
Initilisation state ?
Yes
initialise focus variables
No
S15
S20
S21
S22
Running state ?
Yes
measure current focus FOM
new FOM better than previous ones ?
Yes
update best_FOM; update best posn;
No
S24
S25
Flyback state ?
Yes
initialise position
workout next position to try
S23
No
S26
Track focus state ?
Yes
set large number of frames to be done
S27
increment # of frames measured
S16
S17
done all frames ?
No
Yes
No
go to Idling state; return
S28
go to next state
S18
Focus at position currpos; return
S20

Fig.13.

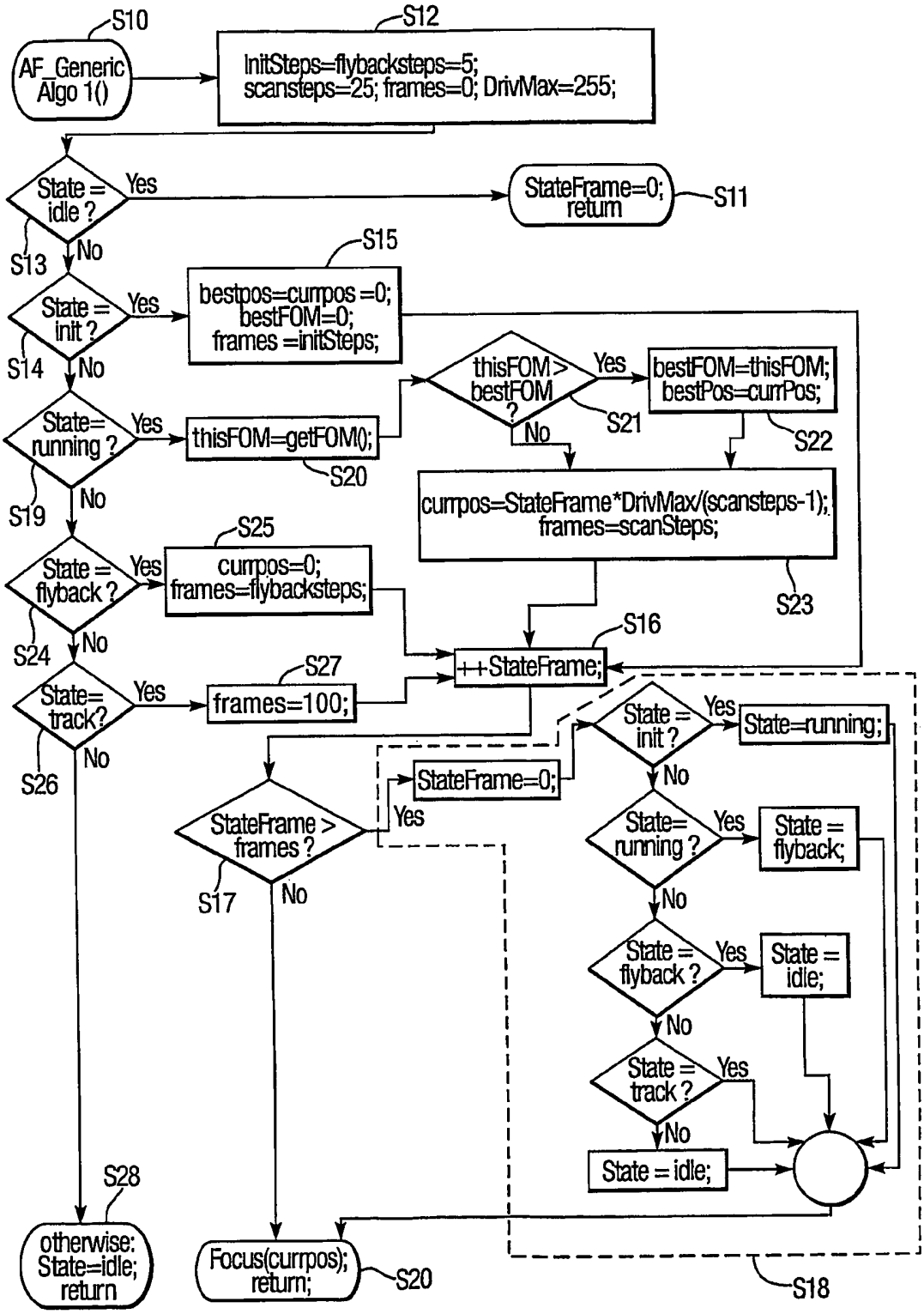

S10
AF_Generic Algo 1()
S12
InitSteps=flybacksteps=5; scansteps=25; frames=0; DrivMax=255;
State = idle ?
Yes
StateFrame=0; return
S11
No
S13
S15
State = init ?
Yes
bestpos=currpos =0; bestFOM=0; frames =initSteps;
S14
No
thisFOM > bestFOM ?
Yes
bestFOM=thisFOM; bestPos=currPos;
S21
S22
State= running ?
Yes
thisFOM=getFOM();
S20
No
currpos=StateFrame*DrivMax/(scansteps-1); frames=scanSteps;
S19
S23
S25
State = flyback ?
Yes
currpos=0; frames=flybacksteps;
S16
No
S24
++StateFrame;
S27
State= track?
Yes
frames=100;
No
S26
State = init ?
Yes
State=running;
No
StateFrame=0;
StateFrame > frames ?
Yes
State= running ?
Yes
State = flyback;
S17
No
No
State = flyback ?
Yes
State = idle;
No
State = track ?
Yes
No
State = idle;
S28
otherwise: State=idle; return
Focus(currpos); return;
S20
S18

Fig.14.

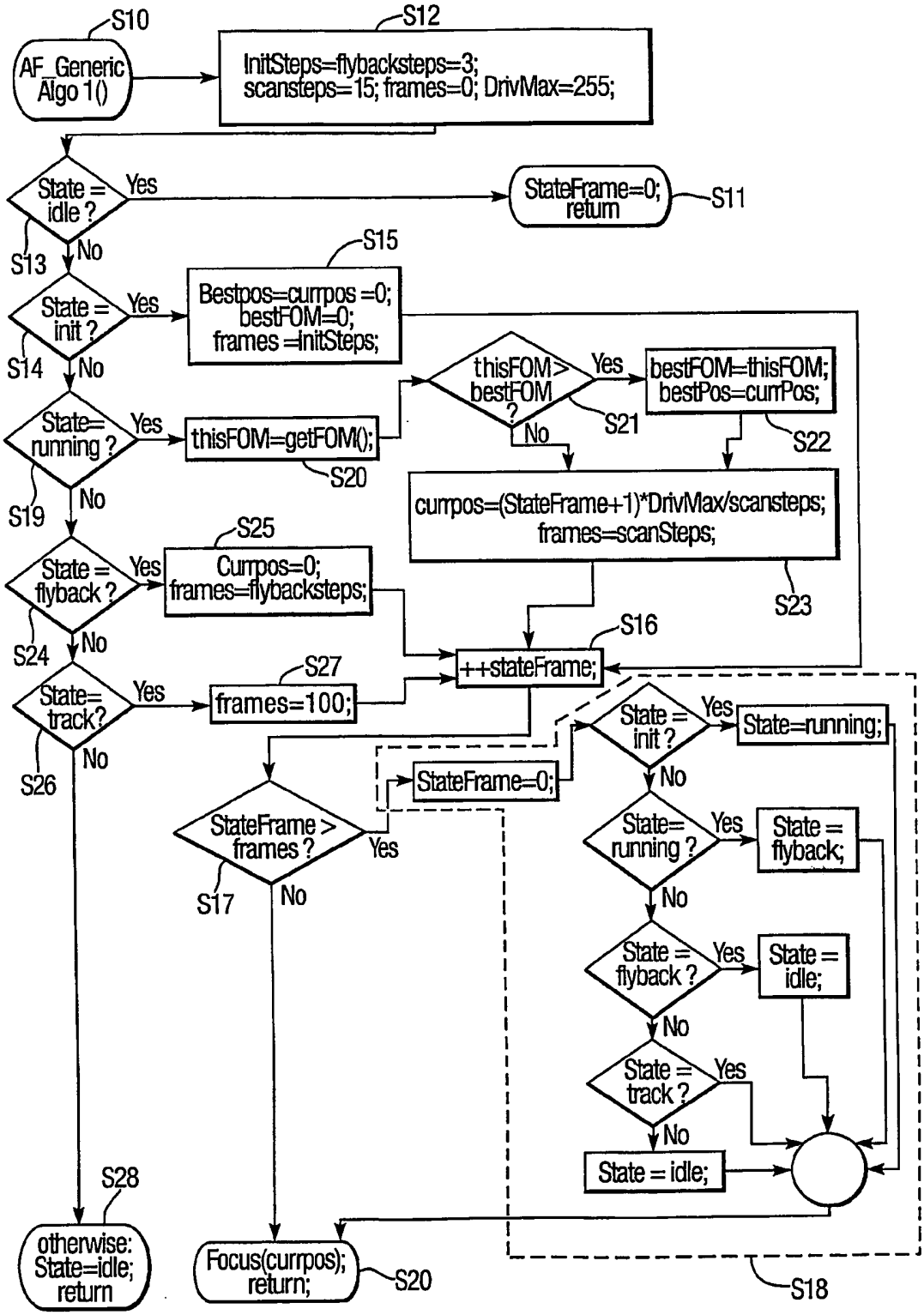

S10
AF_Generic Algo 1()
S12
InitSteps=flybacksteps=3; scansteps=15; frames=0; DrivMax=255;
State = idle ?
Yes
StateFrame=0; return
S11
No
S13
S15
State = init ?
Yes
Bestpos=currpos =0; bestFOM=0; frames =initSteps;
S14
No
thisFOM> bestFOM ?
Yes
bestFOM=thisFOM; bestPos=currPos;
S21
S22
State= running ?
Yes
thisFOM=getFOM();
S20
No
currpos=(StateFrame+1)*DrivMax/scansteps; frames=scanSteps;
S19
No
S23
S25
State = flyback ?
Yes
Currpos=0; frames=flybacksteps;
S16
S24
No
++stateFrame;
S27
State= track?
Yes
frames=100;
S26
No
State = init ?
Yes
State=running;
No
StateFrame=0;
StateFrame > frames ?
Yes
State= running ?
Yes
State = flyback;
S17
No
No
State = flyback ?
Yes
State = idle;
No
State = track ?
Yes
No
State = idle;
S28
otherwise: State=idle; return
Focus(currpos); return;
S20
S18

Fig.15.

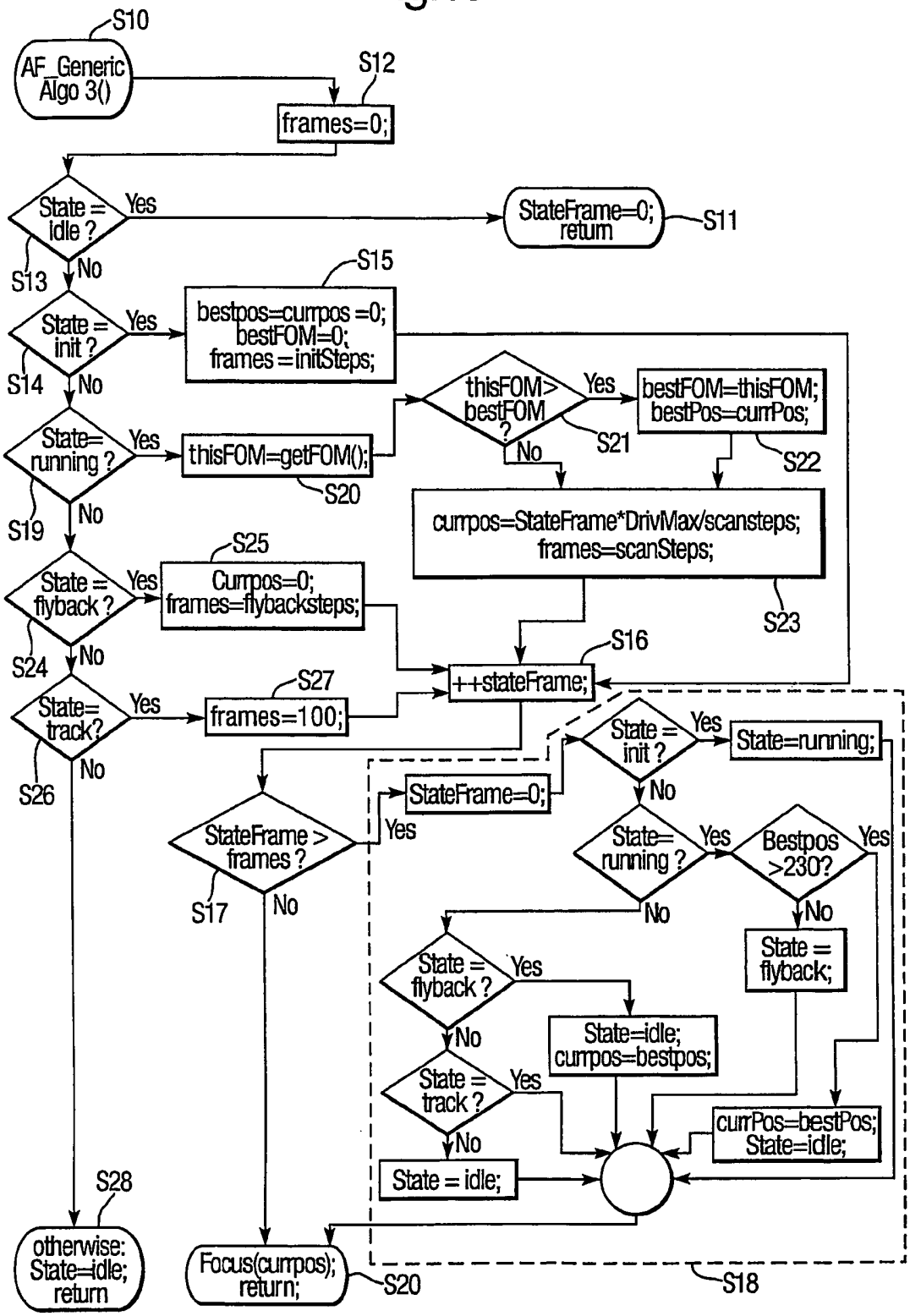
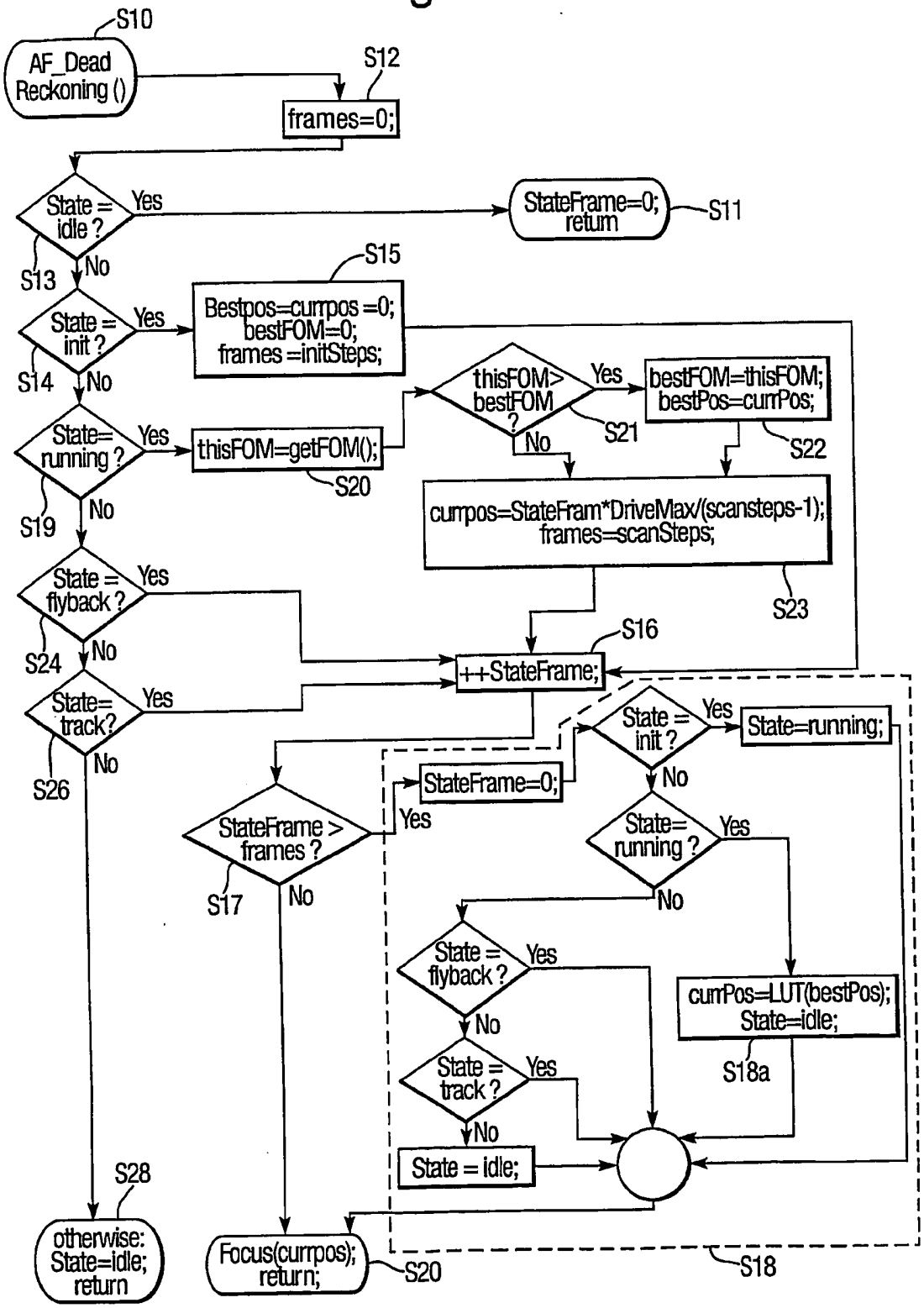

S10
AF_Generic Algo 3()
S12
frames=0;
State = Idle ?
Yes
StateFrame=0; return
S11
S13
No
S15
State = init ?
Yes
bestpos=currpos =0; bestFOM=0; frames =initSteps;
S14
No
thisFOM> bestFOM ?
Yes
bestFOM=thisFOM; bestPos=currPos;
S21
S22
State= running ?
Yes
thisFOM=getFOM();
S20
No
currpos=StateFrame*DrivMax/scansteps; frames=scanSteps;
S19
No
S23
S25
State = flyback ?
Yes
Currpos=0; frames=flybacksteps;
S16
S24
No
++stateFrame;
S27
State= track?
Yes
frames=100;
S26
No
State = init ?
Yes
State=running;
No
StateFrame=0;
StateFrame > frames ?
Yes
State= running ?
Yes
Bestpos >230?
Yes
S17
No
No
No
State = flyback ?
Yes
State = flyback;
State=idle; currpos=bestpos;
No
State = track ?
Yes
currPos=bestPos; State=idle;
No
State = idle;
S28
otherwise: State=idle; return
Focus(currpos); return;
S20
S18

Fig.16.


S10
AF_Dead Reckoning ()
S12
frames=0;
State = idle ?
Yes
StateFrame=0; return
S11
No
S13
S15
State = init ?
Yes
Bestpos=currpos =0; bestFOM=0; frames =initSteps;
S14
No
thisFOM> bestFOM ?
Yes
bestFOM=thisFOM; bestPos=currPos;
S21
S22
State= running ?
Yes
thisFOM=getFOM();
S20
No
currpos=StateFram*DriveMax/(scansteps-1); frames=scanSteps;
S19
S23
State = flyback ?
Yes
No
S24
S16
++StateFrame;
State= track?
Yes
No
S26
State = init ?
Yes
State=running;
No
StateFrame=0;
StateFrame > frames ?
Yes
State= running ?
Yes
S17
No
No
State = flyback ?
Yes
currPos=LUT(bestPos); State=idle;
No
S18a
State = track ?
Yes
No
State = idle;
S28
otherwise: State=idle; return
Focus(currpos); return;
S20
S18